

SEASONAL STUDY OF PHYSICO-CHEMICAL PARAMETERS OF DRINKING WATER IN KHED (LOTE) INDUSTRIAL AREA

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Water is most essential commodity for human consumption and is one of the most important renewable resources, which must be prevented from deterioration in quality. Various Physico-Chemical parameters like P^H , Alkalinity, total hardness, total dissolved solid, calcium, magnesium, nitrate, sulphate have a significant role in determining the potability of drinking water. Lote Industrial area is multiproductivity zone concerned to chemical fertilizers, pesticidal raw as well as finished product. Due to the diversion of sewage water and industrial effluents in to the near by stream courses, water bodies and tanks, the people residing in the colonies which are in close proximity to these tanks are facing serious problems in view of the deteriorating quality of drinking water. Water served to consumer must be free from disease carrying bacteria, toxic substances, excessive amount of mineral and organic matter (GADI et.al. 2003). Various reserchers worked on quality of drinking water drainage manegement of Industrial weast directly or indirectly affect on quality of drinking water in proper location of wells with respect to septic tank, sewer pipe (Industrial waste drainage) will increases potential for the leaching of effluent in the well and ground water system (Shanker Narayana et.al. 1989, Sudarshan and Shravanti 1996, Shravanti et.al. 1997). The annual and seasonal distribution of P^H BOD, COD temperature etc. parameters are studied so as to understood quality of water dependent season (R.P. Chavan et.al. 2006)

Quality of surface and ground water is inadequate even for costummering living and is getting deteriorated due to unwise utilization of water desources, dehumanizing manner of organization, Industrilization and other developed activities (Elayraja 2003). Today many rivers receive million liters of industrial effluents, sewage domestic waste, agricultural and land drainage etc. This effluents cause degradation of water quality the accelrated pace of development and population growth have led to the scarcity of potable water.

In view of above and as such work done by various reserchers, in the present work attemp was made to examine quality of drinking water in and around industrial area (Lote, Khed) out put of this studies will helpful for suggestion to responsiable authority; regarding objectionable finding of water parameters.

METHODOLOGY - Various water sample were collected from ten different places of Lote (Khed) industrial area; sample number 1 to 4 from four different bore well, sample no. 5 and 6 from two different rivers, sample no.7 from general drinking water tank, sample no. 8, 9, 10 from three different wells. Samples were collected in clean polythin bottle (2 lit.capacity) collection and analysis was carried out at peak of each season [i.e. July 25 to August 05, 2008 (Manson), November 25 to December 05, 2008 (Winter), March 25 to April 05, 2009 (Summer)] as per standered procedure (APHA 1998 / 1996) Trivedi and Goal (1986). The major water quality parameter was considered for the analysis as P^H temperature, electrical conductivity, total dissolved solid, Alkalinity, dissolved oxygen, chemical oxygen demand, biological oxygen demand, chlorides and total hardness. The values of this parameters is compared with standered values given by ISI / USPH / ICMR.

RESULTS & DISCUSSION - The Seasonal variation of physico-Chemical parameters of drinking water of presented in the table no.1 The P^H value of drinking water is an important index to acidity; which depends on decrease. The P^H found in studied sample in a range 7.1 to 8.54. The Bureau of Indian standard prescribed the range of P^H in between 6.5 to 8.5. There is no remarkable variation of P^H is found with reference to season. But in all seasons borewell water showed range of P^H in between 7.1 to 7.5 while maximum P^H was found (range 8.00 & above). If P^H value are higher than the permissible limit, this will affect adversely alkalinity of soils, microbial life & corrosion rate. Temperature showed variation with respect to

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season i.e. 21°C to 23°C in monsoon & winter whereas increased in summer season up to 26°C. Borewell water showed less temperature as compare to river & well water. Electrical conductivity is a measure of water capability to transmit electric current & also it is a tool to assess the purity of water. Electrical conductivity found in the range 300 to 1200 $\mu\text{mhos/cm}$. concerned to season it was found maximum in monsoon season compare to winter & summer. It is observed that water with high electrical conductivity values are predominant in sodium & chloride ions & further it is noted that the electrical conductivity is higher during in post monsoon season. Since sampling & analysis were carried out in post monsoon season, specific conductance values are greater than the standard values for four samples. (Purandara et.a. 2003). Concerned to different water samples EC was found to maximum in borewell as well as river water. The TDS of water is probably the most used criterion of its quality. The total dissolved solids (TDS) consists mainly of bicarbonate, carbonate, sulphate, chloride, nitrates and other substance. The TDS found in studied water samples found in the range 300 to 685 mg/L. Quite maximum ranges are found in monsoon season. Concerned to different water samples; river water & well water found to maximum range than permissible limit (by ISI) while borewell & common water supply tank showed satisfactory range of TDS. The huge amount of dissolved solids present in the water is a consideration for its suitability for domestic use only & not for drinking purpose.

Chloride usually occurs as NaCl , CaCl_2 & MgCl_2 & in widely varying concentrations, in all natural waters. They enter water by solvent action of water on salts present in the soil, from polluting material like sewage & trade wastes. Chlorides when reaches concentration above 250mg/L; imparts an unacceptable taste to waters although no adverse effect have been observed on human beings regularly consuming water with much higher concentrations of chloride (Vermani & Narula, 1995). But it may affect to a person who already suffer from disease of heart & kidney (Manivasagam 1983). In studied water samples chloride found in the range 60 to 250mg/L. Respect to seasonal variation maximum concentrations of chloride found in monsoon & summer season. Concerned to different water samples; well water showed quite high range while remaining all water samples showed satisfactory level (Under limit).

The value of alkalinity provide idea of natural salts present in water. In studied water samples alkalinity found in range 120 to 360 mg/L with respect to seasonal variation quite high range was found in monsoon season. Concerned to different water samples; sample 8 (well water) showed concentration above permissible limit by ISI (250, 340 & 360 mg/L); in monsoon, winter & summer respectively while borewell, water supply tank & River water sample showed satisfactory range of alkalinity. Alkalinity is itself not harmful to human beings (Trivedy & Goel, 1986).

Dissolve oxygen (DO), is one of the most important factor for existence of an aquatic organism in water body. It is of a prime importance factor in natural water both as regular of metabolic process of biotic community & indicator of aquatic health. DO found in studied water samples in the range 3.9 to 7.8 mg/L. Seasonal remarkable variation is not found but concerned to different water samples; Borewell water samples showed less DO while maximum was found in well water samples. COD is the amount of oxygen required to carry out oxidation of organic waste by using strong oxidizing agent, where as BOD is amount of oxygen required to microorganism to degrade organic waste anaerobically. The COD values ranges from 2.8 to 6.2 mg/L. Seasonally no remarkable findings but borewell water sample showed less (within permissible limit) compare to remaining all studied water samples while beyond permissible limit was found in water samples of wells. In studied water samples BOD was found to 0.44 to 2.00 mg/L while values were under permissible limit in borewell water samples, River water samples, water supply tank where as in well water samples found beyond permissible limit. Hardness in water is due to natural accumulation of salts from contact with soil & geological formation or it may enter from direct pollution by human activities. Most people like water with little hardness. It usually tastes better & it washes the soap off when you bathe. sulphates, chlorides, silicates etc. of calcium, magnesium, sodium, potassium, aluminum etc. present as impurities in the limestone, become exposed to the solvent action of water & pass into solution, thereby adding to the hardness (Vermani & Narula, 1995). In studied water samples hardness ranges from 100 to 750 mg/L. Little maximum range was found in summer season compare to monsoon & winter. Concerned to different water

samples ; in all studied water sample hardness found within permissible limit excluding well water sample . (showed maximum hardness i.e. beyond permissible limit).

CONCLUSION - It can be concluded that certain parameters like , P^H temperature , EC & chloride (expect sample no. 9 in summer) was found to under permissible limit in all ten different water samples. Parameters like TDS , DO , COD , BOD & hardness

was found to beyond permissible limit in well water samples (no. 8 , 9 & 10) while in borewells water samples (01-04) , River water samples (05 & 06) & water supply for drinking (no. 07) found under permissible limit i.e. satisfactory ; suitable for drinking. In the present study concerned to seasonal change in parameter ; there was no remarkable change of parameter as per season was found expect electrical conductivity , temperature & quite chloride.

Table No. 1

Seasonal variation of drinking water parameters

Parameters	Permissible Limit by ISI	MONSOON July 25 – Aug. 05, 2008	WINTER Nov. 25 – Dec. 05, 2008	SUMMER Mar. 25 to April 05, 2009
P ^H	6.5 to 8.5	7.1, 7.2, 7.2, 7.3, 8.3, 8.54, 8.50, 7.88, 8.3, 7.55	7.32, 7.2, 7.50, 7.28, 7.5, 7.6, 8.80, 8.00, 8.22, 7.8	7.00, 7.25, 7.10, 7.42, 7.60, 7.92, 8.00, 7.62, 8.25, 8.15
Temperature	in °C	22, 21, 22, 23, 24, 24, 24, 24, 25, 25	20, 22, 21, 21, 23, 23, 24, 22, 23, 23	24, 24, 25, 25, 26.5, 26.5, 26.00, 25.5, 25.5, 26
Electrical Conductivity	Upto 1500 µmhos/cm	1000, 1200, 800, 750, 880, 670, 850, 950, 1000, 1200	450, 480, 400, 300, 500, 550, 600, 420, 350, 450	550, 440, 420, 520, 450, 420, 650, 600, 550, 500
Total Dissolved solid	500mg/l.	350, 300, 350, 325, 550, 600, 425, 465, 450, 600	300, 385, 280, 250, 600, 520, 450, 410, 420, 565	380, 345, 320, 300, 685, 560, 445, 380, 420, 550
Alkalinity	50-200 mg/L	150, 160, 120, 140, 150, 140, 140, 160, 250, 120	140, 140, 150, 140, 150, 130, 140, 120, 240, 130	140, 140, 150, 150, 150, 160, 180, 150, 260, 140
Dissolve Oxygen (Do)	4-6 mg/L	4.1, 4.2, 4.5, 4.5, 5.3, 5.4, 5.2, 7.2, 7.5, 7.2	4.5, 4.2, 4.00, 4.2, 4.9, 4.8, 5.00, 7.2, 7.90, 7.8	3.5, 4.2, 4.1, 4.5, 5.2, 5.5, 5.2, 7.1, 7.2, 7.7
COD	4 mg/l.	3.5, 3.2, 2.8, 3.2, 4.00, 3.8, 3.5, 6.2, 4.00, 4.2	3.2, 2.5, 2.8, 3.00, 3.9, 3.6, 2.9, 5.8, 3.9, 5.2	2.9, 3.3, 3.2, 3.00, 3.5, 3.5, 3.00, 5.5, 5.6, 6.2
BOD	1 mg/L	0.54, 0.58, 0.71, 0.80, 0.81, 0.60, 0.55, 1.2, 1.5, 0.9	0.44, 0.50, 0.53, 0.75, 0.65, 0.55, 0.65, 1.5, 2.00, 0.95	0.58, 0.62, 0.70, 0.65, 0.75, 0.65, 0.77, 1.8, 2.00, 1.00
Chloride	250 mg/L	180, 150, 120, 150, 80, 60, 150, 120, 150, 140	150, 140, 150, 150, 100, 80, 140, 150, 200, 220	200, 180, 150, 140, 100, 80, 100, 150, 250, 200
Total hardness	500 to 600 mg/L	320, 340, 270, 280, 140, 100, 200, 650, 720, 750	350, 320, 380, 350, 250, 240, 180, 680, 700, 780	420, 380, 380, 360, 240, 294, 300, 678, 745, 750

* All values of parameters are presented in mg/L except temperature (in °C), EC (in µmhos/cm) & P^H

* Underline values are beyond permissible limits.

* ISI – Indian standard of India.

Table No. 2

Sample No.	Water Source
Sample No. 01	Borewell – 1
Sample No. 02	Borewell – 2
Sample No. 03	Borewell – 3
Sample No. 04	Borewell – 4
Sample No. 05	River – 1
Sample No. 06	River – 2
Sample No. 07	Water supply for drinking (Tank) – 1
Sample No. 08	Well – 1
Sample No. 09	Well – 2
Sample No. 10	Well – 3

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